



Characteristics of International Robot Industry Development and Its Enlightenment to China

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Abstract

Under the context of robot technology development as a special technology project implemented by “the Twelfth Five-Year Plan”, China’s robot industry has witnessed a continuously expanding of market capacity with gradual increase of its brand awareness, but its growth rate still cannot fully meet the updated market demand. Therefore, from an international perspective, this article summarizes the status of the industry development, industrial policies and operating characteristics in United States, France, Japan and other developed countries, in hope of providing policy guidance for furthering promoting the robot industry in China through learning advanced experience from their development, adopting the good points and avoiding the shortcomings.

Key words: Robot industry; Industrial policy; Experience and reference

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INTRODUCTION

In 2012, China issued “the Twelfth Five-Year” special project of robot technology development, which requires that during the period of “the Twelfth Five-

Year”, we should conquer a number of intelligent high-end equipment, develop and foster a number of core enterprises with over 10 billion RMB high-tech output value, and at the same time, focus on fostering development of the emerging robot industry. The implementation of this plan also indicates that China will further advance the industrialization process of robot, to promote China’s economic restructuring and technological innovation. Therefore, this article, from an international perspective, summarizes the status of robot industry development, takes as a reference to the experience of robot industry development in United States, France and Japan, and puts forward policy recommendations suitable for China’s robot industry development.

1. THE OVERVIEW OF INTERNATIONAL ROBOT INDUSTRY DEVELOPMENT

Back in history, it has been 55 years since the birth of the world’s first robot. Currently, all types of robot products continue to emerge and the technology constantly advances with the times. Robots have gradually integrated into our daily lives and been playing an irreplaceable role. Among various robots, industrial robots are first applied and now become the most mature. Meanwhile, advances in technology have driven the development of the robot discipline, expanding the applications from industrial robots to special and service robots.

According to the International Federation of Robotics (IFR), data showed that the global sales of industrial robots in 2012 are the second highest in history. In 2012, a total of 159,000 robots were sold worldwide, which almost equaled the highest of 165,000 in 2011. The slight decline in robots sales is mainly due to shrinkages in electronics manufacturing, metal and machinery industries. However, the sales of industrial robots in the automotive industry increased by 6% and the amount of orders also increased in chemistry, rubber and plastics

industry as well as the food industry. During 2008-2012, the average annual growth rate of global robot sales was 9%. In 2012, about 70% of industrial robots are mainly exported to the following five countries: Japan, China, the United States, South Korea and Germany.

Compared with industrial robots, service robots have also witnessed a substantial growth in sales trend. By the end of 2010, 13,741 units of professional service robots were sold with an increase of 4% than 2009 and were worth 3.2 billion US dollars with an increase of 15% over 2009. The number of military robots was 6,125 units, accounting for 45% of all the professional service robots newly installed, with its major application for UAVs. In summary, with respect to the industry of industrial robots, service robots industry is still an emerging one with a huge number of companies but none of them being dominant except for in a few areas.

2. COMPARISON IN DEVELOPMENT EXPERIENCE OF INTERNATIONAL ROBOT INDUSTRY

2.1 The United States

When talking about the development of international robot industry, what can't be missed is the superpower—the United States. As a developed country with both strong economic strength and research capabilities, the United States spared no effort in emphasizing the development of the robot industry. The US government actively carried out strategic changes and awareness innovation, reemphasize the experimental development and theoretical innovation of robot products and support the transformation of robot achievements from the source. Specifically, at the levels of aviation detection, artificial touch intelligence, multi-language interaction and military, the US robot products have reached and realized high precision as well as complete and reliable performance, and are widely recognized by the market. So far, the US robot industry has achieved exceptional results, in terms of technology accumulation, product acceptance and brand building, and it has brought invaluable contribution to the development of US economy and the advancement of life quality.

2.2 France

In the latter half of the 20th century, the robot manufacturing industry gradually developed in France. After years of development, the French robot manufacturing industry is currently composed of three kinds of enterprises: small and medium-sized enterprises (SMEs) of traditional service and industrial robots, emerging research SMEs and large-sized defense companies. Generally speaking, small and medium-sized enterprises count as the majority in France, but most of

them concentrate in specific areas or technologies, with only a dozen of them capable of producing complete sets of robotic equipment. As of 2010, the French research community is made up of more than sixty research teams engaged in robotics researches, composed of about 600 researchers and 300 PhD candidates. Today, France has the world's leading robotics research team, especially competitive in the field of service robots around the world.

2.3 Japan

Japan had been extremely hopeful of its robot industry. In recent years, the Japanese have realized the important role of service robots, and increased its construction and capital investment. Japan supports the development and application of robots in accordance with users' needs and formulates a series of required systems. Based on this, the Japanese support and advocate an user-oriented approach of confirming its functions and upgrading the necessary technology and performance through researches, developments, demonstrations and experiments. Japan's efforts for innovation on the robot industry ensured its market share in the current robot markets. From this it can be seen that strengthening technological advancement is still the essence for the full competitiveness of Japanese robot industry.

3. THE OVERVIEW OF CHINA'S ROBOT INDUSTRY DEVELOPMENT AND ANALYSIS OF THE EXISTING PROBLEMS

3.1 The Overview of China's Robot Industry Development

Compared with the advantageous development of foreign robot industry, China started late in robot industry, but in recent years, China has achieved rapid development in terms of both the robot market demand and the market capacity. In 2010, the sales in Chinese robot market were 14,980 units; in 2011, the sales reached 22,577 units with an increase of 50.7 percent; in 2012 Chinese robot sales reached 28,042 units with an increase of 24.2%. By 2015, China's total market demand for robots will reach 35,000 units, accounting for 16.9% of the global share, and thus becoming the largest market. But from the perspective of brand, the top ten of robot sales in China's robot market are dominated by foreign brands. Although most of the market shares are taken over by foreign manufacturers, the rise of small and medium-sized domestic robot manufacturers has injected endless vigor into the future development of China's robot industry. The robot researches are developing quickly in Shenyang, Xi'an, etc. and the Pearl River Delta has experienced the quickest increase in the application market.

3.2 Analysis of the Existing Problems in China's Robot Industry

3.2.1 Small Market Size and Low Acceptance Rate

The irreversible situation of the market's low acceptance rate of Chinese robot products has become the largest shackle of restricting its development. Foreign robot products are leading a repressive role in terms of technology, performance and reliability, which make domestic manufacturing buyers not only reject domestic brands from the concept level, but also the market level. Therefore, even in the face of high maintenance costs for robot parts, domestic enterprises always enjoy buying foreign products. It shows that it is obviously inadequate to rely solely on the strategy of low prices to change this situation and that it needs time to enhance the core competitiveness of domestic products.

3.2.2 Incomplete Industry Chain

The localization level of important robot parts is the most significant quantitative index of the formation of a country's robot industry. For robot products, in addition to the manufacturing of the robot body, the processing of important parts, the integrating and debugging of software and control system, after-sales service and other elements constitute the robot industry chain. Due to inability to ensure quality and quantity supply from the market level, China's robot industry has not yet formed an industry chain. The passive development pattern of taking orders from others would not be reversed in the short term.

3.2.3 Inadequate Implementation of the Support Policies

Before the launch of "the Twelfth Five-Year Plan", there was no specific planning or industrial policies designed for robot industry development. The distinct strategic consensus has failed to form from the perspective of ideology and the choice of which high-tech industries are given priority to developing. Therefore, China's industrial robot industry lacks the "top-level design" of all levels. There has not been a unified administration from the country level to implement policy planning or set industry standards, which has certain constraints on the industry development. Although there are supporting plans on relevant robot industry from the central to the local governments, the overall fragmented system and difficult situation of forming a joint development have contributed to the overall unsatisfactory results. Centralized management by specific departments and industrial planning should also be identified and the absence of industry policies and standard researches should be supplemented.

4. THE REFERENCE OF INTERNATIONAL ROBOT INDUSTRY DEVELOPMENT FOR CHINA

After understanding the current status of international robot industry and the advanced experience of robot

industry in developed countries, we have realized the existing problems of the China's robot industry and the gap with foreign robot industry. Therefore, this section, from an international perspective, takes the robot industrial development in other countries as a reference for China, and eventually puts forward policy recommendations for the future development of China's robot industry.

4.1 To Enhance Our Knowledge and Increase Policy Support

We should make the robot industry the priority in future development as a pioneer for the high-end equipment manufacturing industries and implement every policy on the development of robot industry from central to local levels. Tax reduction, increase of science and technology funding, simplification of office programs, etc. should be further carried out. Especially for robot industry and other high-tech enterprises, tax incentives will give them "nutrition" which is more sustainable and more direct. This will have a tremendous impact on cultivating and developing China's leading robot enterprises.

4.2 To Encourage Involvement of Diversified Investments and the Main Body of Research and Development

In view that the large-scaled and industrialized development of the robots has not yet formed in China, most robot manufacturers are small and medium-sized enterprises (SMEs). Therefore, it is imperative to construct on the covenant-lite financing and its diversification of small and medium-sized scientific and technological enterprises. In addition to the national policy subsidies and support funds, we should enhance the introduction of social capital and encourage corporate bonds and the joint of private equity investment and venture capital, which will better promote the orderly operation of the industry.

4.3 To Establish a Definite Mode of Development

The National Program for Long- and Medium-Term Scientific and Technological Development and the National "Eleventh Five-Year Plan" have both listed the robot industry as a key support subject. Therefore, China should develop a detailed roadmap in line with the spirit of long- and medium-term plan. We should combine our long-term goals with short-term goals, design a number of products reflecting key technology to some extent, establish a feasible technology roadmap and carry out it by phases, which are critical to the development of China's robot industry. The research on development model should include technological development model, project implementation model, industrial model as well as the relationships among the technology of all kinds of robots. To determine a development model both forward looking and maneuverable as well as consistent with our national conditions, is the fundamental guarantee to achieve our strategic objectives.

CONCLUSION

At present, China's robot industry is in the primary stage of the industry cycle, and is lagging behind the United States, Japan, France and other developed countries in technology research and development, formation of a complete production chain, construction of the upstream and downstream partners, foundation of the brand and many other aspects. But due to this exact gap, China's robot industry would take as a reference the advanced experience of robot industry development in Western developed countries, adopt the good points and avoid the shortcomings, give full play to our own advantages of huge base and policy support for manufactures, and strive to realize the new take-off of China's robot industry under the background of the integration of production, finance and school.

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